

# CHANNEL DANCER

## Related Applications

This application claims priority on U.S. Provisional Application No. 60/197,682, entitled "Channel Dancer", which is hereby incorporated by reference.

## Technical Field

The technical field is delivery of broadband content and personalized multimedia content delivery systems.

## Background

Over the past ten years, the bandwidth capacity available to consumers for receiving content from the Internet and other networks has increased ten-fold and more. The increased bandwidth capacity has enabled consumers to download larger and larger files and other content, including rich media and multimedia content such as video clips, songs and movies. This increased bandwidth capacity has increased Internet usage and the potential for enjoyable and productive usage.

Despite the increased bandwidth capacity, however, prior to the present invention, there were no consumer-based broadband services that automate the delivery of rich media and multimedia content directly to the consumer's personal computer (PC) or Internet access device. Prior to the present invention, there were no service providers optimizing the use of a broadband connection by distributing multiple channels of rich media content and providing a mechanism to automate the selective tuning to desired material. Prior to the present invention, there were no mechanisms available to support Internet protocol ("IP") recording and hence the time-shifted viewing of rich media material broadcast to the consumers PC or Internet access device.

Likewise, there has been an increase in the efforts of companies to gather information about consumers and to target consumers with advertising. Despite this effort, however, prior to the present invention there was no user interface that incorporates a profiling engine in offering personalized access to available material. Indeed, prior to the present invention, there was no personalized offering of rich media material to consumer PCs and Internet access devices. Further, companies gathering information about consumers seek to utilize that information remotely from the consumer PC or Internet access device, therefore raising privacy concerns. Moreover, prior to the present invention there were user interfaces are available that

1 support downloading rich media content and provide utilities for the ongoing  
2 management of local disk resources that store or cache the rich media content.

3 For the broadcaster or source of content, advertising, and e-commerce  
4 opportunities to a consumer PC or Internet access device, prior to the present  
5 invention there was no way to combine multiple threads of targeted advertising with  
6 the delivery of broadband video, without the expensive pre-broadcast process of  
7 authoring of video content. Authoring of video content is a frame-by-frame, labor-  
8 intensive process of associating advertising into video content by inserting  
9 "triggers" in the video stream itself. Likewise, prior to the present invention, there  
10 was no way to support multiple concurrent channels of IP-based video within a  
11 system that allows individual clients to dynamically link to channels of a specific  
12 interest. Moreover, prior to the present invention, there was no easy, integrated way  
13 to implement pay-per-view ("PPV") and subscription in the distribution of  
14 broadcast video content. Further, the broadcaster, prior to the present invention, has  
15 no way to receive real-time statistics on system usage, including targeted  
16 advertising impressions and click-throughs.

#### 17 **Summary**

18 A system and method (the "Channel Dancer") of delivering broadband  
19 content that has been personalized for a recipient user is disclosed by this  
20 application. By excelling in the personalization of the user's view of broadband  
21 content on the Internet and otherwise, the system and method develop "stickiness"  
22 with the user that maximizes the benefits and effectiveness of advertising and  
23 related activities.

24 An embodiment of the system comprises a network operations center  
25 ("NOC") that collects, aggregates and classifies content, assigns appropriate  
26 targeted advertising and e-commerce material to the content, and schedules the  
27 content for transmission on "virtual channels", a transmission medium, such as a  
28 satellite, that transmits the virtual channels, an edge-of-net location, such as a  
29 broadband Internet Service Provider ("ISP"), that receives the virtual channels  
30 transmitted from the transmission medium, and a user machine (*e.g.*, a personal  
31 computer ("PC")) on which resides client software (the "client"). The NOC also  
32 preferably generates and transmits to the client a control channel comprising content  
33 programming information and graphical user interface ("GUI") "skins" updates.  
34 The GUI skins are used to dynamically update GUIs through which the user views

1 and selects content, and are used to deliver target advertising and e-commerce  
2 opportunities based, for example, on user feedback. The system preferably also  
3 comprises a point-of-presence ("POP") client server, referred to as the "Channel  
4 Dancer" server, which resides at the edge-of-net location, or another location, and  
5 that acts as a router, propagating requested or personalized virtual channels to the  
6 client. The NOC may also comprise one or more servers for carrying out the above  
7 tasks and for keeping track of user feedback received over the Internet or otherwise,  
8 handling pay-per-view transactions and managing client services, including billing.

9 **[Independent Claims]**

10 **Brief Description of the Figures**

11 The detailed description will refer to the following drawings, in which like  
12 numbers refer to like items, and in which:

13 Figure 1 is a block diagram overview of a system for delivering personalized  
14 broadband content.

15 Figure 2a and 2b are block diagrams illustrating exemplary hardware for  
16 servers and user machines of the system for delivering personalized broadband  
17 content.

18 Figure 3 is a flowchart of a method for delivering personalized broadband  
19 content.

20 Figure 4 is a block diagram illustrating a NOC and operation of the NOC in  
21 detail.

22 Figure 5 is a flowchart of a method of content and advertising aggregation  
23 and management.

24 Figure 6 is a flowchart of a method of content and advertising classification.

25 Figure 7 is a flowchart of a method of content and advertising scheduling.

26 Figure 8 is flowchart of a method of network controller operation.

27 Figure 9 is a block diagram illustrating a channel controller component and  
28 operation of the channel controller.

29 Figure 10 is a flowchart of a method of channel controller operation at the  
30 NOC.

31 Figure 11 is a block diagram of components of and operation of a POP client  
32 server of the system for delivering personalized broadband content.

33 Figure 12 is a flowchart of a method of POP client server operation.



The NOC 12 preferably comprises a plurality of servers, controllers, storage devices and other components that are generally responsible for the overall operations of the system 10. In a sense, the NOC 12 may also be thought of as a “headend” of the system 10. The NOC 12 preferably collects, aggregates and classifies content (*e.g.*, video, audio and Web data) 122. The NOC 12 preferably assigns (*e.g.*, based on the classification of the content) appropriate targeted advertising, e-commerce material and other promotional or commerce-related material (collectively, “assigned material”) to the content 122.

A content scheduler application (not shown) of the NOC 12 preferably schedules the content (with the assigned material) 122 for transmission on the virtual channels 124. Each virtual channel 124 preferably has a “main” video (or audio) component that is the primary content stream. Each virtual channel 124 preferably can concurrently carry several multiplexed streaming sub-components and preferably includes an integrated file transfer capability. Therefore, advertising and other promotional material, as one sub-component, may be associated with the primary content stream or main component, by synchronizing the advertising with the broadcast content on one virtual channel at run time (when the virtual channel is created and broadcast), leaving the primary content stream unaltered. For example, the primary content stream may have known commercial breaks; the content scheduler preferably synchronizes the advertising with the commercial breaks so that the virtual channel displays the advertising during these commercial breaks. Consequently, preprocessing (authoring) of the principal video or audio stream is not required to deliver multiple targeted advertising streams in tandem.

The NOC 12 also generates special low-bandwidth virtual channels 124 referred to as “control channels.” The control channels are preferably configured to continually broadcast content 122 programming information. The control channels preferably also carry client 20 graphical user interface (“GUI”) updates (“skins”). As discussed below, the client 20 may present received content 122 and the content 122 programming information to the user with GUIs. The GUI skins may be used to brand and personalize the GUIs, including material displayed in banners and other locations of the GUIs. By dynamically updating the GUI skins, the system 10 provides flexibility in both branding and personalization as well as supporting the insertion of targeted advertising and e-commerce opportunities with the GUI itself (*e.g.*, in GUI banners).

Further, the control channel 126 preferably delivers, among other things, an event database and a java applet. The java applet, preferably executed by the client 20, preferably reads a user personal profile and event database in order to display a dynamic GUI. The control channel 126 may also feed a rich media screen saver that provides information about content 122, advertizing and e-commerce opportunities on a user's screen saver.

The NOC 12 preferably packages the virtual channels 124 as Internet Protocol ("IP") Multicast streams and then delivers them via the transmission medium 14 (*e.g.*, satellite) to the broadband ISPs 16 at the edge of the Internet. The broadband ISPs 16 are preferably enabled to receive and transmit high bandwidth (*e.g.*, > *kPs*) content, providing the ISP subscribers with high bandwidth service. Preferably, point-of-presence ("POP") client servers (not shown) sitting on the backbone (not shown) of the broadband ISPs 16 receives the virtual channels 124. The POP client servers preferably act primarily as gateway Multicast routers, propagating requested virtual channels 124 (multicast streams) over the ISP's 16 backbone, and on to the user machines 18. The POP client servers may propagate virtual channels 124 as determined based on, *e.g.*, user feedback, advertising and e-commerce hits and viewing habits (collectively, "user feedback").

The client 20 on the user machine 18 preferably transmits user feedback, including advertising and e-commerce hits generated by the user on the user machine 18, to the NOC 12 via, *e.g.*, the Internet or other transmission medium. The client 20 may transmit this information in response to requests from the NOC 12 or as scheduled. The NOC 12 preferably records this information in a transaction database (not shown) located at the NOC 12.

Figure 2a is a block diagram illustrating exemplary hardware components for implementing the various servers of the system 10 for delivering personalized broadband content. For example, the exemplary hardware shown may be used to implement the servers of the NOC 12 or the POP client server. Server 30 typically includes a memory 32, a secondary storage device 34, a processor 36, an input device 38, a display device 40, and an output device 42. Memory 32 is preferably a computer-readable medium and may include RAM or similar types of memory, and it may store one or more applications 44 for execution by processor 36. Secondary storage device 34 is preferably a computer-readable medium and may include a hard

disk drive, floppy disk drive, CD-ROM drive, or other types of non-volatile data storage.

Processor 36 executes the application(s) 44, which is stored in memory 33 or secondary storage 34, or received from the Internet or other network. Input device 38 may include any device for entering information into server 30, such as a keyboard, mouse, cursor-control device, touch-screen, microphone, digital camera, video recorder or camcorder. Display device 40 may include any type of device for presenting visual information such as, for example, a computer monitor or flat-screen display. Output device 42 may include any type of device for presenting a hard copy of information, such as a printer, and other types of output devices include speakers or any device for providing information in audio form. Server 30 may store a database structure in secondary storage 34, for example, for storing and maintaining such information as described herein.

Also, processor 36 may execute one or more software applications 44 in order to provide the functions described in this specification, and the processing may be implemented in software, such as software modules, for execution by computers or other machines, such as the user machine.

Figure 2b illustrates typical components of a user machine 18 used by a user. User machine 18 typically includes a memory 45, a secondary storage device 46, a processor 48, an input device 50, a display device 52, and an output device 54. Memory 45 is preferably a computer-readable medium and may include random access memory (RAM) or similar types of memory, and it may store one or more applications 56 (may include application(s) 44 received from server), including the client 20, and a web browser 58, for execution by processor 48. Secondary storage device 50 is preferably a computer-readable medium and may include a hard disk drive, floppy disk drive, CD-ROM drive, or other types of non-volatile data storage. Processor 48 may execute applications 56 (and/or 44) or programs stored in memory 45 or secondary storage 46, or received from the Internet or other network (not shown). For example, the processor 48 preferably executes the client 20 in order to provide the client functions described herein.

Input device 50 may include any device for entering information into user machine 18, such as a keyboard, mouse, cursor-control device, touch-screen, microphone, digital camera, video recorder or camcorder. Display device 52 may include any type of device for presenting visual information such as, for example, a

1 computer monitor or flat-screen display. Output device 54 may include any type of  
2 device for presenting a hard copy of information, such as a printer, and other types  
3 of output devices include speakers or any device for providing information in audio  
4 form.

5 Web browser 58 is used to display the dynamic GUIs described herein.  
6 Examples of web browsers include the Netscape Navigator program and the  
7 Microsoft Internet Explorer program. Any web browser, co-browser, or other  
8 application capable of retrieving content from a network and displaying pages or  
9 screens may be used.

10 Examples of user machines 18 include personal computers, laptop  
11 computers, notebook computers, palm top computers, network computers, wireless  
12 devices, or any processor-controlled device capable of executing a web browser or  
13 other type of application for interacting with the system.

14 Although only one server 30 is shown, the servers described herein may use  
15 multiple servers 30 as necessary or desired and may also use back-up or redundant  
16 servers to prevent network downtime in the event of a failure of a particular server.  
17 In addition, although machine 18 and server 30 are depicted with various  
18 components, one skilled in the art will appreciate that the user machines 18 and the  
19 server 30 can contain additional or different components. In addition, although  
20 aspects of an implementation consistent with the present invention are described as  
21 being stored in memory, one skilled in the art will appreciate that these aspects can  
22 also be stored on or read from other types of computer program products or  
23 computer-readable media, such as secondary storage devices, including hard disks,  
24 floppy disks, or CD-ROM; a signal, a carrier wave from the Internet or other  
25 network; or other forms of RAM or ROM. The computer-readable media may  
26 include instructions for controlling a computer system, such as user machine 18 and  
27 server 30, or other device, to perform a particular method (e.g., such as the methods  
28 described herein).

29 Figure 3 is a flowchart illustrating a method 60 of delivering personalized  
30 broadband content. The method 60 preferably comprises: processing content 62,  
31 assigning promotional material to content 64, scheduling content for transmission as  
32 virtual channels 66, configuring a control channel 68, delivering virtual channels 70,  
33 propagating requested virtual channels 72 and collecting user feedback 74.  
34 Processing content 62 preferably comprises collecting, for example, audio, video



1 and Web data, aggregating the audio, video and Web data together, and classifying  
2 the audio, video and Web data. The content 122 is preferably collected from a  
3 variety of sources and collecting may comprise receiving or retrieving the content  
4 122 from external sources or from internal sources (e.g., content databases).  
5 Aggregating may comprise storing received or retrieved content 122 in a NOC 12  
6 data repository (not shown), assigning the content 122 an expiration date, reviewing  
7 content to assure adherence to standards required for NOC 12 processing  
8 operations, and/or assigning live feeds directly to a specific channel controller (not  
9 shown) for inclusion in a specific virtual channel 124. Classifying the content 122  
10 may comprise assigning each item of content 122 a particular class or category  
11 based on pre-determined guidelines. For example, all live sports may be assigned a  
12 class "live-sports" and a Monday Night Football™ game a sub-class "live  
13 professional football".

14 Assigning promotional material to content 64 preferably comprises  
15 assigning appropriate targeted advertising, e-commerce material and other  
16 promotional or commerce-related material (collectively, "assigned material") to the  
17 content 122. The appropriateness of the assigned material may be determined by  
18 the classification of the content 122 and the correlation of the assigned material to  
19 that classification. For example, a beer commercial may be targeted advertising for  
20 the class "live-sports" and especially the sub-class "live professional football."  
21 Therefore, the beer commercial is appropriate targeted advertising for the Monday  
22 Night Football™ content.

23 Scheduling content for transmission as virtual channels 66 preferably  
24 comprises assigning content, and assigned material, on virtual channels 124 so as to  
25 efficiently transmit the content. For example, "live-sports" content may be grouped  
26 together on one or more virtual channels 124 to minimize the number of virtual  
27 channels that are transmitted to a user requesting or being targeted with "live-  
28 sports" content.

29 Configuring a control channel 68 preferably comprises creating a low-  
30 bandwidth virtual channel 124 with information comprising a description of the  
31 content 122 scheduled on the virtual channels 124 and a description of each virtual  
32 channel 124. The control channel is preferably continually transmitted and updated  
33 so as to contain accurate and up-to-date information on the content 122 and the

virtual channels 124 being broadcast at present and in the future. Configuring a control channel may also comprise loading GUI skins on the control channel so GUI skin updates may be transmitted to the user machine 18.

Delivering virtual channels 70 preferably comprises transmitting the virtual channels 124 to the broadband ISP 16. Delivering preferably comprises packaging the virtual channels 124 as IP Multicast streams and transmitting the virtual channel 124 IP Multicast streams via the transmission medium 14 (*e.g.*, satellite) to broadband ISPs 16. Propagating requested virtual channels 72 preferably comprises transmitting virtual channels 124 that have been requested by the client 20 or that are being targeted to the user via a broadband connection to the user machine 18. The client 20 may request virtual channels 124 that the user has specified or that fit some criteria pre-determined by the user (*e.g.*, such as a personal profile) or that are determined by user feedback.

Collecting user feedback 72 preferably comprises the NOC 12 receiving user feedback from the user machine 18. The client 20 may transmit the user feedback as requested or polled by the NOC 12 or at regularly scheduled intervals, for example. The user feedback is preferably transmitted via the Internet, but other transmission mediums may be used.

Figure 4 illustrates various components of the NOC 12 and depicts operations of the NOC 12. As shown, the NOC 12 preferably comprises a network controller 126, a plurality of channel controllers 128, an IP gateway 130, an uplink 132 and one or more data repositories 134. As mentioned above, the NOC 12 preferably also comprises a NOC server (not shown in Fig. 4) that runs various software applications, as represented by the following software modules: a content & advertising aggregation/management module 136; a content & advertising classification module 137; and, a content & advertising broadcast scheduling module 138 (*i.e.*, the content scheduler 138). Content 122 preferably includes computer file-based material as well as live video/audio streams (*e.g.*, IP, digital or analog streams), although content may include video, audio, text and other material from a variety of sources (*e.g.*, recorded material such as video and audio tapes, DVDs, CDs, taped-delay audio/video streams, off-air broadcast content). Advertising, e-commerce and other promotional material (collectively, "promotional material") may be considered a subset of content 122.

Content 122, with or without related promotional material, preferably is retrieved from or dropped off by partner content providers or otherwise received from a content provider or source. The content and advertising aggregation\management module 136 preferably registers the file-based content 122 in a data repository 134 and assigns the file-based content 122 a content expiration date. The content expiration date is generally a date on which the file-based content 122 is considered out-of-date, redundant, super-ceded, or past the content's usefulness, although the expiration date may also be arbitrarily chosen. The expiration date enables an ongoing auto-cleanup procedure of the NOC data repository 134 (*e.g.*, deleting all content 122 with an expired expiration date). The content and advertising aggregation\management module 136 preferably also reviews and processes promotional material to ensure adherence to standards required for NOC transaction processing operations. For example, these standards may include hyper-text markup language ("HTML") templates that incorporate "hooks" used by the client 20 to link to backoffice operations (*e.g.*, NOC 12 operations that track e-commerce purchases or advertising clicks, as described below with reference to Fig. 17) to which the promotional material should conform (*i.e.*, the promotional material includes these templates). The content and advertising aggregation\management module 136 preferably assigns live (and taped-delay) feeds directly to a channel controller 128 for inclusion as a component of a specific virtual channel 124.

Figure 5 is a flowchart illustrating an exemplary method 1360 of content and advertising aggregation and management. The method 1360, preferably executed by the content and advertising aggregation\management module 136 as described above, comprises receiving/retrieving content from content providers 1361, registering content in data repository 1362, assigning a content expiration date 1363, reviewing and processing advertising and e-commerce material to ensure adherence to standards 1364 and assigning live feeds to a channel controller 1365.

Referring again to Figure 4, the content and advertising classification module 137 preferably classifies the content 122 and promotional material so that the content 122 and promotional material may be targeted or filtered for users based on user personal profiles, feedback or other criteria. The content and advertising module preferably classifies content 122 according to parameters that enable a preference-based filtering through an intelligent application of a user's personal

1 profile by the client 20. The personal profile preferably includes various descriptive  
 2 data about the user and the user's content preferences and may be created through  
 3 question and answer sessions or other feedback, such as viewing/listening habits  
 4 and content hits and may be dynamically updated to reflect changes in the user's  
 5 preferences. The classification parameters are preferably defined to correspond to  
 6 classification parameters of the personal profile. For example, live sports content  
 7 receives a classification that corresponds to a classification in the personal profile of  
 8 a user that prefers live sports. The content and advertising module may classify  
 9 content 122 with classes and sub-classes to reflect specific sub-categories of a  
 10 general category (*e.g.*, a professional football game in a class "live sports", sub-  
 11 class "professional football game") and/or to show that the content 122 fits within  
 12 multiple categories and/or sub-categories. What is the nature of the content (*i.e.*,  
 13 whether a movie, a sports event, a infomercial, a news program, a weekly program,  
 14 etc.) may be determined, for example, automatically from a content title or  
 15 descriptor (*e.g.*, a numeric code) encoded with the content or by a human operator  
 16 that examines a description of the content, a content title or the content itself. Once  
 17 this is determined, known methods of content classification may be used.

18 The content and advertising classification module 137 preferably classifies  
 19 promotional materials according to demographic parameters that enable the  
 20 targeting of one of several concurrently delivered advertising streams towards a user  
 21 (*e.g.*, based on personal profile). The promotional materials may be received with  
 22 related content, as described above, or unassociated with other content. The  
 23 demographic parameters are defined to correspond with the demographics of users  
 24 so that advertising and e-commerce designed for users with certain demographics  
 25 are targeted and sent the targeted promotional materials. For example, a beer ad  
 26 designed for 25 to 35 year-old males is preferably classified accordingly. What is  
 27 the nature of the promotional material (*e.g.*, a beer commercial, an infomercial, an  
 28 e-commerce opportunity) and for what users the promotional material is designed  
 29 may be determined, for example, automatically from a title or descriptor (*e.g.*, a  
 30 numeric code) encoded with the promotional material or by a human operator that  
 31 examines a description of the promotional material, a promotional material title or  
 32 the promotional material itself. Once this is determined, known methods of  
 33 promotional material classifying may be used.

1           Figure 6 is a flowchart illustrating an exemplary method 1370 of content and  
2 advertising classification. The method 1370, preferably executed by the content and  
3 advertising classification module 137 as described above, preferably comprises  
4 determining the nature of the content/promotional material 1371, classifying content  
5 to enable filtering 1372 or classifying promotional material to enable targeting  
6 1373.

7           Referring again to Figure 4, the content scheduler 138 is preferably  
8 responsible for the ongoing program scheduling of content 122 across virtual  
9 channels 124. The content scheduler 138 preferably schedules content 122 and  
10 related promotional materials for inclusion as part of a virtual channel 124 that  
11 supports concurrent broadcast of multiple subcomponents, including video and  
12 audio streams, as well as files. The content scheduler 138 dynamically determines  
13 the scheduling of content 122 and promotional materials based on a variety of  
14 criteria. For example, the content scheduler 138 may schedule content 122 of one  
15 classification (*e.g.*, live sports) together on one or more virtual channels 124.  
16 Likewise, the content scheduler 138 may schedule content 122 provided from one  
17 content source together on one or more virtual channels 124. Further, the content  
18 scheduler 138 may schedule content 122 based on the bandwidth necessary to  
19 receive the content 122 (*e.g.*, scheduling high bandwidth content together). Once the  
20 content scheduler 138 determines on which virtual channel 124 to schedule certain  
21 content 122, the content scheduler 138 preferably scheduled the content by sending  
22 real-time commands to the network controller 126 in order to provide process  
23 control of the channel controllers 128, which are responsible for the actual  
24 production of a virtual channel 124.

25           Figure 7 is a flowchart illustrating an exemplary method 1380 of content &  
26 advertising broadcast scheduling. The method 1380, preferably executed by the  
27 content scheduler 138 as described above, preferably comprises: determining on  
28 which virtual channel to schedule content 1381; scheduling the content for inclusion  
29 as part of a virtual channel 1382; and, scheduling related promotional materials for  
30 inclusion as part of the virtual channel 1383. As noted above, the determining step  
31 1381 may be based on a variety of criteria. In this example, promotional material  
32 related to the scheduled content is also scheduled on the same virtual channel 124.  
33 Alternatively, the promotional material, whether related or not, may be scheduled

1 on a different virtual channel 124 (e.g., on a promotional material-only virtual  
2 channel that is linked to the content 122 by the client 20 at the user machine 18).

3 Referring again to Figure 4, the network controller 126 is preferably a  
4 server-based software application package that provides top level network  
5 management functionality and that is responsible for controlling other components  
6 of the NOC 12. For example, the network controller 126 preferably issues  
7 instructions/commands to the channel controllers 128, directing the operation of the  
8 channel controllers 128 and the dynamic configuration of the virtual channels 124.  
9 The network controller 126 may accomplish the dynamic configuration by  
10 maintaining an open Transmission Control Protocol/Internet Protocol ("TCP/IP")  
11 connection to each individual channel controller 128, issuing basic  
12 instructions/commands that activate or deactivate content 122 subcomponents,  
13 thereby defining the composition of the virtual channel 124. The network controller  
14 126 preferably also issues a system-wide clock pulse that ensures timing  
15 synchronization across virtual channels 124.

16 Figure 8 is a flowchart illustrating an exemplary method 1260 of network  
17 controller operation. The method 1260, preferably executed by the network  
18 controller 126 as described above, preferably comprises: opening and maintaining a  
19 TCP/IP connection to a channel controller 1261; instructing the channel controller  
20 to activate or de-activate content subcomponents 1262; and synchronizing virtual  
21 channels 1263.

22 Figure 9 is a block diagram illustrating a channel controller 128 and  
23 operation of the channel controller 128. The channel controller 128 preferably is a  
24 software application package that manages coordination of the various components  
25 used for the creation and transmission of an individual virtual channel. Hence, the  
26 channel controller preferably comprises the following modules: a network  
27 command processor 1281; a media server 1282; a file broadcast module 1283; and,  
28 a IP multiplexer 1284. The network command processor 1281 preferably accepts  
29 instructions/commands from the network controller 126 to drive the operation and  
30 interaction of the other modules. The media server 1282, e.g., a Microsoft™  
31 ("MS") Media Server or RealNetworks, Inc.™ Server, preferably produces a real-  
32 time Multicast IP stream suitable for play by a media player (not shown in Figure  
33 9), e.g., a MS Media Player or RealPlayer™. For example, the media server 1282

stream may be an active streaming format ("ASF") formatted user datagram protocol/internet protocol ("UDP/IP") suitable for the MS Media Player or a Realtime Streaming Protocol ("RTSP") suitable for the RealPlayer. The media server 1282 stream is generated from content 122 transmitted to the channel controller. For example, the media server 1282 stream may be generated from a file source (e.g., from the data repository 134) or from a live or tape-delayed feed, such as an analog feed with the assistance of an encoder (not shown) that encodes the analog feed for digital transmission.

The file broadcast module 1283, e.g., a CacheStream XD™ ("extreme datacasting") file broadcast module, preferably provides for the file transfer subcomponent of the virtual channel 124, enabling files to be transfer via the virtual channel 124 to a user machine 18. The file broadcast module preferably receives files and converts them to a stream. The file broadcast module preferably outputs the stream via a TCP/IP connection to the IP multiplexer 1284; the TPC/IP connection provides flow control to any actual file transfer process.

The IP multiplexer 1284, e.g., a Cachestream CMX IP-Mux™ ("channel manager extreme"), preferably combines the streams produced by the media server 1282 and the file broadcast module 1283 configures the combined streams into a single output IP multicast stream from the channel controller 128. The IP multiplexer 1284 preferably encrypts the output IP multicast stream and protects the output stream, e.g., by forward error correction. As shown in Figure 9, preferably each output IP multicast stream is a virtual channel 124.

Referring again to Figure 4, the output multicast IP streams from each channel controller 128 preferably flow over a NOC 12 local area network ("LAN") to the IP Gateway 130. The IP Gateway 130 may be a third party commercial product, such as SkyStream's IP Gateway™. The IP Gateway 130 forwards the virtual channels 124 to the uplink 132. The uplink 132 is connected to the transmission medium 14 and may be, for example, a satellite uplink.

Figure 10 is a flowchart illustrating an exemplary method 1280 of channel controller operation. The method 1280, preferably executed by a channel controller 128 as described above, preferably comprises: receiving network controller commands 1285; producing a media server stream for a media player 1286; providing file transfer subcomponent stream 1287; combining streams into an

output IP multicast stream 1288; and, encrypting and error protecting the output stream 1289. The stream produced for the media player in the producing step 1286 may be a different format (*e.g.*, not ASF) and type (*e.g.*, not UDP/IP) than that described herein, as determined by available media players in use on user machines 18.

Referring to Figure 1, as discussed above, the NOC 12 delivers virtual channels 124 via the transmission medium 14 (e.g., satellite) to the broadband ISPs 16 at the edge of the Internet. The broadband ISPs 16 are preferably enabled to receive and transmit high bandwidth (e.g., > kPs) content, providing the ISP subscribers with high bandwidth service. Broadband ISPs 16 may include, for example, companies providing high bandwidth access via digital cable lines, DSL, T-x lines or Ethernet. Figure 11 illustrates an exemplary broadband ISP 16 comprising a broadband ISP backbone 162, a receiver 164, and a POP client server 80. The broadband ISP backbone 162 preferably handles the major communication traffic of the broadband ISP 16. The receiver 164 (e.g., a satellite receiver) preferably receives the virtual channels (IP multicast streams) 124 from the transmission medium 14.

The POP client server 80 preferably sits on the broadband ISP backbone 162. The POP client server 80 preferably receives the virtual channels 124 received by the receiver 164 and is preferably configured to capture a subset of, or all, virtual channels 124 broadcast from the NOC 12. The POP client server 80 may be located elsewhere (*i.e.*, separate from the broadband ISP 16) and may receive the virtual channels 124 directly (*e.g.*, from the transmission medium 14 or the NOC 18). The POP client server 80 preferably acts primarily as a simple Multicast router, propagating those virtual channels 124 that have actually been requested by at least one client 20, over the broadband ISP backbone 162 for transmission to user machines 18. The POP client server 80 preferably also supports a utility application that allows each individual client 20 to assess the client's host user machine 18 link speed (*i.e.*, bandwidth capacity) to the POP client server 80 upon startup. The link speed is preferably used to determine the availability of certain virtual channels 124 for the user machine 18. For example, if a certain virtual channel 124 contained content requiring a bandwidth greater than the bandwidth capacity of a user machine 18, the user machine would not receive that virtual channel 124.



Figure 12 is a flowchart illustrating an exemplary method 800 of POP client server operation. The method 800, preferably executed, at least in part, by the POP client server 80 as described above, preferably comprises: assessing user machine link speed 801; determining client's virtual channel availability 802, capturing a subset of virtual channels 803; and, propagating requested virtual channels over IP backbone 804. The assessing step 801 and/or determining step 802 may be performed by, or in cooperation with, the client 20 of the user machine 18 being assessed. For example, the assessing step 801 may comprise the client 20 sending a request for link speed assessment upon startup on the user machine 18, the POP client server 80 transmitting test packets of varying bandwidths to the user machine 18, the client 20 reporting the transmission times for the test packets to the POP client server 80, and the POP client server 80 calculating the bandwidth capacity of the user machine 18 from this information. Virtual channels 124 that required a bandwidth exceeding this bandwidth capacity may then be determined to be outside the client's 20 available virtual channels 124. The subset of virtual channels 803 may be determined by the bandwidth capacity of all user machines 18 serviced by a broadband ISP 16. For example, if the bandwidth capacity of all user machines 18 of a broadband ISP 16 is below a level required by certain virtual channels 124, the POP client server 80 may not capture these certain virtual channels 124 in the capturing step 803.

Each user machine 18 that receives virtual channels 124 from the POP client server 80 preferably hosts a client 20, as described above. The client 20 is preferably a software package that incorporates Internet browser and media player (e.g., MS IE and Media Player) technologies in order to provide flexibility in personalized selection and presentation of the multidimensional media content 122 available from the virtual channels 124. The client 20 preferably continually scans the control channel (described above), which preferably delivers scheduling and classification information on programming carried by the virtual channels 124 available to the client 20. The client 20 preferably enables each individual user (e.g., family members) on a single user machine 19 to fill out a personal profile describing personal interests in content 122 as well as GUI theme (skin) preference.

Since the content 122 on the virtual channels 124 is preferably uniformly classified, the client 20 may apply, at the user's request or otherwise (e.g., as directed by the NOC 12 or the POP client server 80), a user's personal profile to

1 filter the presentation of available programming to include content 122 specified as  
2 being of interest to the user. The client 20 may then present the filtered, personal  
3 content 182 (see Figure 1) for selection, as a personalized view of available  
4 programming. Users may select the personal content 182 from across available  
5 virtual channels 124 for either immediate viewing or for caching - and future, on-  
6 demand access. The client 20 preferably continually monitors the ongoing  
7 allocation of disk resources and provides utilities and safeguards that allow each  
8 user to manage their personal disk cache. The client 20 preferably incorporates a  
9 "clean-up" feature that automatically deletes outdated or expired content.

10 Figure 13 illustrates an embodiment of the client 20. As shown, the client  
11 20 preferably comprises a background data capture routine 201 and a customizable  
12 user interface (*e.g.*, a dynamic GUI) 202. The background data capture routine 201  
13 preferably that "tunes" to and interprets virtual channels 124, including the control  
14 channel 125. The customizable user interface 202 supports management and  
15 display of incoming data (*e.g.*, content and promotional material) through the  
16 selection of hyper-links (*e.g.*, hyper-text markup language ("HTML") links). The  
17 customizable user interface 202 preferably utilizes dynamic HTML routines 2021,  
18 personal profiles 2022 and dynamic GUI skins 2023 received from the control  
19 channel 125 to create a personalized display 2024.

20 Upon startup, the client preferably connects to the local POP client server 80  
21 to determine link speed (as described above with reference to Figures 11-12) and  
22 automatically opens the control channel 125 used to provide programming  
23 information and deliver dynamic GUI "skins". In the system 10 for delivering  
24 personalized broadband content, the dynamic GUIs 202 and their hyper-links are  
25 preferably customized for each individual user through the dynamic creation of  
26 displays that are a function of personal interests as defined in the personal profile, as  
27 well as indicated preferences in GUI presentation (skins). The customizable  
28 interface 202 hyper-links preferably support the communication of information  
29 regarding user selection of content 122 back to the background capture routine 201  
30 for execution. When a hyper-link for a virtual channel 124 is selected for display or  
31 caching, the background capture routine 201 automatically opens membership to the  
32 appropriate multicast service, effectively tuning to the requested virtual channel  
33 124. A multicast channel, like a broadcast channel, is generally available while  
34 being broadcast. In order to tune to the multicast channel, the client 20 preferably

1 issues a "join" request to join the multicast group of the desired virtual channel 124.  
2 This request is sent to the nearest router (*e.g.*, POP client server 80) in order for the  
3 client 20 to join the group (*i.e.*, open membership to the appropriate multicast  
4 service).

5 The client 20 preferably enables the concurrent capture of two virtual  
6 channels 124 (as well as the control channel 125), making it possible to watch one  
7 program or content item while recording (caching) another. The client 20  
8 preferably accomplishes the caching of content 122 (*e.g.*, video and audio streams)  
9 through implementation of a process and file structure. The content 122 is  
10 preferably cached in a user cache 203 on the user machine 18. Digital rights  
11 management of the cached content is discussed below.

12 Figure 14 is a flowchart illustrating an exemplary method 210 of operation  
13 of the client 20. The method 210, preferably executed by the client 20 as described  
14 above, preferably comprises: scanning the control channel 211; filtering available  
15 content 212; selecting content 213; if the content is selected for immediate viewing,  
16 displaying content 214; if the content is not selected for immediate viewing, caching  
17 content 215; monitoring allocation of resources 216; and deleting content 217. As  
18 noted above, the content 122 may include audio content, so "viewing" and "display"  
19 are meant to include listening to or playing audio alone or in conjunction with  
20 video, text, or other material. Selecting content 213 may comprise the client 20  
21 selecting content that has been chosen by a user (*e.g.*, by clicking on a hyper-link on  
22 the dynamic GUI). The monitoring allocation of resources 216 may comprises  
23 determining available space in the user cache 203 and may be performed when  
24 content 122 is cached or at regular intervals, for example. The deleting content 217  
25 may comprise deleting content 122 that has an expired expiration date. The steps of  
26 the method 210 may be repeated as necessary (for example, the scanning step 211 is  
27 preferably executed continually and as new content is available, the filtering step  
28 212 may be performed.)

29 Figure 15 is a flowchart illustrating an additional exemplary method 220 of  
30 operation of the client 20. The method 220, preferably executed at least in part by  
31 the client 20 as described above, preferably comprises: connecting to server 221;  
32 determining link speed 222; opening control channel 223; customizing dynamic  
33 user interface 224; selecting virtual channel(s) 225; tuning to virtual channel(s) 226;  
34 and concurrently displaying a first selected virtual channel while caching a second





Internet 127 to the user machine 18, as illustrated by a License Generation 821 block. The License file is used as a control mechanism for both pay-per-view operations and digital rights management of content recordings (as described above with reference to Figure 16). By including the user machine 18 profile in the License file, the client services server 82 "ties" the License file to a specific user machine 18, preventing use of the License file on another user machine 18. The client services server 82 preferably hosts a Web-site that allows users to view a password protected statement of the user's account with respect to pay-per-view and other operations, as illustrated by the client account reporting 823 block. The client account reporting 823 preferably accesses the client database 822 to determine the user's account balances and transactional information.

Figure 18a is a flowchart illustrating an exemplary method 240 of user registration and license file creation. The method 240, preferably executed by the client services server 82 in conjunction with a client 20 as described above, preferably comprises: registering a user 241; assigning user an id number 242; receiving profile of user machine 243; generating a license file 244; and, transmitting license file to the user machine 245. Registering a user 241 preferably comprises storing user information in the client database 822. Assigning user an id number 242 preferably comprises the client services server 82 randomly generating a unique user id number. The receiving step 243 preferably comprises the client service server 82 receiving a profile of the user machine 18 generated by the client 20 installed on the user machine 18. The generating step 244 preferably comprises the client services server 82 storing the user id and user machine profile in a license file and encrypting the license file. The transmitting step 245 preferably comprises the client services server 82 transmitting the license file to the user machine 18.

Figure 18b is a flowchart illustrating an exemplary method 250 of user account inquiry. The method 250, preferably executed by the client services server 82 in conjunction with the client 20, preferably comprises: displaying user account Web-site 251; requesting user password 252; accessing user information from client database 253; and, displaying user account information 254. The displaying step 251 preferably comprises the client services server 82 transmitting one or more Web-pages (not shown) over the Internet to the user machine 18 for display by the client 20 on a browser (e.g., MS I/E). The user password may be assigned or chosen by a user during user registration. If the user password is properly entered,



Figure 19 is a flowchart illustrating an exemplary method 260 of pay-per-view access. The method 260, preferably executed by the PPV server 84 and a client 20 as described above, preferably comprises: purchasing credits 261; transferring credits to a user account 262; granting pay-per-view access 263; issuing an encrypted certificate 264; storing the encrypted certificate 265; and validating the encrypted certificate 266. Transferring credits to a user account 262 may comprise a third party transferring credits to the user account as a reward (*e.g.*, for visiting the a Web-site). The granting step 263 preferably comprises verifying that the user has sufficient credits. The validating step 266 preferably comprises comparing the user ID in the certificate with that stored in the user's License file stored on the user machine 18 and comparing the user machine profile in the License file to the user machine 18. If both the user ID and user machine 18 are verified, the certificate is encrypted and the user may view the PPV event or content on the user machine 18.

Figure 20 is a logic flow/block diagram illustrating another exemplary method 270 of PPV access. As shown, the method 270 preferably comprises a user ordering PPV content or a PPV event 271, wherein the PPV content 272 is a show costing 25 credits; the PPV server 84 debiting the user's account by 25 credits 273; creating an encrypted digital certificate 274, wherein the certificate comprises the show ID and the user ID; checking the license file of the client 275; and checking the user machine profile 276.

Referring back to Figure 17, the e-commerce router 86 is preferably a server responsible for routing e-commerce opportunities to clients 20 and re-routing e-commerce transactions to third-party e-commerce providers. Web-based e-commerce opportunities within the system 10 that are broadcast as part of a virtual channel 124 are preferably first processed at the NOC 12 (*e.g.*, by NOC staff) to implement an "interception" of purchase transactions back to the NOC 12. When a user selects an e-commerce opportunity for purchase (or other use) via a client 20, the e-commerce purchase is preferably intercepted by the NOC 12, and specifically by the e-commerce router 86 (*e.g.*, via the Internet). The e-commerce router 86 preferably records each incoming (secure) purchase in a transaction database 861. The e-commerce router 86 then preferably automatically securely re-routes the purchase to the originally defined destination, as indicated by the re-route transaction block 862. The implementation of this e-commerce routing provides a strict control mechanism for the tracking of e-commerce generated revenues, and





1 incorporates the capability of tracking the personal viewing habits of each user  
2 profiled per client installation. Data mining collects user personal habits,  
3 preference, or opinions on a voluntary basis in exchange for credits, which may be  
4 redeemed for pay-per-view purchases. Advertising partners may create "credit  
5 enable" Web pages (not shown). These pages preferably incorporate an automated  
6 transaction that credits a user's account in exchange for the return of information, or  
7 for the viewing of specific advertising opportunities. The same transaction  
8 automatically debits the advertiser's account, supporting the generation of a  
9 commercial invoice for credits allocated. This automated transaction preferably  
10 utilizes the PPV server 84 to accomplish these credits and debits, as described  
11 above. This data mining enables qualified lead generation (e.g., sales leads) for  
12 vendors, such as automotive dealers.

13 Moreover, the system 10 operators may provide credits to users for viewing  
14 advertising. These credits may be redeemed for pay-per-view or other purchases.  
15 The client 20 preferably verifies that the user watched the advertisement (e.g., that  
16 the complete advertisement was displayed) and provides advertisers a unique  
17 opportunity to target advertising and verify that their content is viewed.

18 Figure 23 is a flowchart illustrating an exemplary method 300 of data  
19 mining. The method 300 preferably comprises: requesting user information in  
20 exchange for credits 301, wherein the credits may be used to purchase PPV content  
21 and events; receiving the requested user information 302; and crediting the user  
22 account with credits 303. The method 300 may also comprises debiting credits  
23 from a third-party account, wherein the number of credits credited to the user  
24 account are debited from the third-party account.

25 Figure 24 is a block diagram illustrating an alternative embodiment of the  
26 NOC.

27 Figure 25 is a flowchart illustrating an exemplary method 310 of creating a  
28 dynamic GUI. The method 310 preferably comprises: determining data  
29 accommodation of a user machine 311 and, creating a dynamic GUI using the  
30 determined data accommodation and a user's personal profile 312. The data  
31 accommodation is preferably the bandwidth capacity of a user machine 18.

32 Figure 26 is a flowchart illustrating an exemplary method 320 of delivering  
33 personalized broadband content. The method 320 preferably comprises: receiving a  
34 request for a portion of Multicast IP data 321; receiving Multicast IP data at internet

1 service provider 322; receiving a control channel 323; locating the requested portion  
2 of Multicast IP data with information from control channel 324; communicating  
3 requested portion of Multicast IP data to client 325; and, determining if user is  
4 authorized to view requested portion of Multicast IP data 326. The receiving a  
5 request step 321 may comprise the POP client server 80 receiving a request for  
6 content 122 from a client 20. The receiving Multicast IP data step 322 may  
7 comprise the POP client server 80 receiving the virtual channels 124 at the  
8 broadband ISP 16. The receiving a control channel step 323 may comprise the POP  
9 client server 80 receiving the control channel 125 at the broadband ISP 16. The  
10 locating step 324 may comprise the POP client server 80 locating the virtual  
11 channel 124 with the requested content 122 using information contained on the  
12 control channel 125. The communicating step 325 may comprise the POP client  
13 server 80 transmitting the requested content over a broadband connection to the user  
14 machine 18 on which the client 20 resides. The determining step 326 may comprise  
15 checking for a certificate file and/or checking a license file, as described above, to  
16 verify user authorization.

17 Figure 27 is a flowchart illustrating another method 330 of advertising in the  
18 system 10 for delivering personalized broadband content. The method 330  
19 preferably comprises: sending advertisement linked to content 331; displaying the  
20 advertisement with the content if called for display 332; storing advertisement in  
21 memory 333; recalling advertisement for display with other content 334; and,  
22 linking advertisement with other content 335. The sending step 331 may comprise  
23 an advertising provider transmitting an advertisement to the NOC 12. The  
24 displaying step 332 comprises the client 20 displaying the advertisement with its  
25 linked content on the user machine 18. The storing step 334 may comprise the  
26 client 20 storing the content in the user cache 203. The recalling step 334 may  
27 comprise the client 20 retrieving the stored advertisement from the user cache 203  
28 when the stored advertisement meets some criteria with regard to content being  
29 displayed (e.g., a beer commercial for display during a football game). The linking  
30 step 335 may comprise the client 20 re-linking the advertisement to content for  
31 future display.  
32